REMARKS

Upon entry of the present Amendment-A the claims in the application are claims 1-9, of which claims 1, 3, 4 and 8 are independent.

The applicant gratefully acknowledges the Examiner's indication that claim 3, although objected to, contains allowable subject matter.

Claim 3 is rewritten herein in independent form, and new claims 4-9 are added. No new matter is added, and the amendment are fully supported in the specification as discussed below.

After careful consideration of the rejections set forth in the Office Action, the applicant respectfully submits that as listed herein, all pending claims patentably distinguish over the art of record, and requests allowance of all pending claims, as discussed further below.

In the Claims:

Claim Rejections – 35 USC 102

At item 1 of the Office Action, the Examiner rejected claim 1 under 35 USC 102(b) as anticipated by Nakamura (US 6,909,802).

In the rejection, the Examiner states that Nakamura discloses an image analysis device comprising first and second cameras constituting a set of stereo cameras, and a distance calculation section (col. 3, lines 25-30) which is adapted to calculate a distance to an object in such a manner that a first image of the object is extracted from an image of a field taken by the first camera while a second image of the object corresponding to the first image of the object is extracted from a seeking area being set in another image of the field taken by the second camera. The Examiner refers to Nakamura's Fig. 2, col. 3, lines 55-60, which discloses extracting a sample from a first image taken from the left camera and extracting a sample data from the

second image taken from the right sensor. The extracted amount of data is of equal pixel numbers and are therefore of equal size.

The Examiner further states that Nakamura discloses depending on the extracted first image using a correlation calculation process, and then a parallax between the first and second images is calculated (col. 4, lines 8-25 in which parallax between images is used), wherein the distance calculation section is further adapted to set a moving increment based on the width of an object frame that is determined depending on the first image of the object, and to execute the correlation calculation process while moving the first image of the object stepwise at the moving increment in the seeking area so as to extract a new seeking area which consists of a correlation area that exhibits a high degree of correlation with the first image of the object and two areas that sandwich the correlation area. The Examiner notes that Fig. 4 discloses calculating the shift amount; col. 3, line 60- col. 4, line 5 provides a brief overview; col. 8 lines 20-61 discloses sequential shifting the seeking frame continuously running a correlation calculation in order to find the area with the highest correlation value and degree of correspondence; col. 7, lines 34-40 disclose altering the position within at least one of the images.

Applicant's Response

Nakamura (USP 6,909,802) discloses an image-correspondence position detecting device by which image data of specific size are extracted from right and left images, correlation values, which represent the degree of correspondence between the right and left images, are calculated while sequentially shifting the sampling position from one of the images, a partial correlation value for an optional partial area smaller than the extracted image is calculated, and regions of high correlation value and low correlation value are determined in the extracted images.

More particularly, Nakamura discloses an image-correspondence position detection

device and a distance measuring device that is capable of accurately detecting boundaries of overlapping objects in images. The distance measuring device 10 (Fig. 7) includes a pair of sensor units 102, 104 corresponding to claimed first and second cameras, and also includes a distance calculator 110. The distance calculator extracts rows of data of identical numbers of pixels of an object sensed by the left and right sensor units 102, 104. Specifically, Nakamura discloses calculation of a correlation between each pair corresponding pixels of the left and right images so as to generate a correlation value line f(i). This procedure is repeated while holding the data from the left sensor unit 104 fixed and varying the extraction position of the right sensor unit 102. That is, the reference section sensed by the right sensor 102 is sequentially shifted a uniform distance d, and the reference sections are arranged so as to overlap (col. 7, lines 10-22, Fig. 3B). This permits determination of a sampling position of optimum degree of correspondence. At the position of optimum correspondence of the correlation value row, the degree of correspondence between pixels in a partial area is calculated, whereby boundaries of an object can be recognized.

The applicant respectfully disagrees that Nakamura anticipates the applicant's claimed invention since Nakamura does not disclose every claimed feature, as is the standard for an anticipatory rejection (MPEP 2131).

In particular, Nakamura does not disclose extracting a second image of an object from a seeking area set in another image of the field taken by the second camera. That is, Nakamura does not disclose using a "seeking <u>area</u>", but instead discloses extracting <u>rows</u> of data of identical numbers of pixels of an object image sensed by the left and right sensor units, and then calculating a correlation value line f(i) for two extracted data <u>rows</u>. <u>A "line" or "row", being one-dimensional, is not equivalent to an "area", which is two dimensional</u>.

In addition, Nakamura does not disclose the following features recited in claim 1 of the present application: (a) the distance calculation section is adapted to set a moving increment based on the width of an object frame that is determined depending on the first image of the object; (b) the distance calculation section is adapted to execute the correlation calculation process while moving the first image of the object stepwise at the moving increment in the seeking area; and (c) the distance calculation section is adapted to extract a new seeking area which consists of a correlation area that exhibits a high degree of correlation with the first image of the object and two areas that sandwich the correlation area.

With regard to feature a), Nakamura does not disclose setting a moving increment "based on the width of an object frame that is determined depending on the first image of the object" as claimed. That is, Nakamura does not disclose determining an object frame. Rather, Nakamura discloses setting overlapping data row sections R1, R2, R3 within the image obtained by the right sensor unit 102. Each of the plural row sections obtained from the right side camera has the same number of pixels as the fixed data row section of the left sensor unit 104, to which they are compared.

With regard to feature b) although Nakamura discloses varying the data extraction position of the right sensor unit by relative shifting by a uniform distance, Nakamura does not suggest moving the "first image of the object stepwise at the moving increment in the seeking area" as claimed. That is, Nakamura clearly teaches using overlapping data rows to determine a position of best correspondence, whereas the applicant disclose a stepwise movement (ie, non-overlapping) of the first image within the seeking area.

With regard to features (a) and (b), in Nakamura, image data of specific size are extracted from right and left images, and a sampling position at which the correlation value is high

(referred to as an integer correspondence position) is sought and specified while sequentially shifting the sampling position in one of the images and maintaining the sampling position in the other of the images. Such a procedure is categorized in a conventional correlation calculation, and when the sampling position in one of the images is sequentially shifted, the sampling position at present partially overlaps the previous sampling position (this observation is clear from FIGS. 3A and 3B). Accordingly, Nakamura does not disclose a procedure in which the image of the object is moved stepwise at the moving increment in the seeking area.

With regard to feature (c), the applicant disagrees that Nakamura discloses extracting a "new seeking area" which consists of "two areas which sandwich" a correlation area that exhibits a high degree of correlation with the first image of the object, as claimed. Nakamura does not disclose extraction of seeking <u>areas</u>, but instead extracts data <u>rows</u>. Moreover, upon determination of the row exhibiting a high degree of correlation, Nakamura does not set a new search row which includes both the row determined to exhibit the high degree of correlation and the two rows which sandwich the row determined to exhibit the high degree of correlation. Rather, upon determination of the row exhibiting a high degree of correlation, Nakamura discloses calculation of the degree of correspondence between pixels in a partial area so that distances can be calculated and boundaries of an object can be recognized.

Nakamura only discloses the steps of seeking and determining a position of extracted image at which the correlation value is high (referred to as an integer correspondence position), setting a partial image area smaller than the extracted image in the extracted image, and evaluating the degree (high or low) of the correlation value of every partial image area, and thus Nakamura does not disclose the features of the present invention.

When comparing with claim 1 of the present application, "an extracted image at an

integer correspondence position" in Nakamura may correspond to "a correlation area that exhibits a high degree of correlation with the first image of the object" in claim 1, and "a partial image area" may correspond to "a new seeking area". In Nakamura, the partial image area is set within the extracted image at the integer correspondence position. In contrast, in the invention of claim 1, the new seeking area is defined by not only a correlation area that exhibits a high degree of correlation with the first image of the object, but also two areas that sandwich the correlation area, and such a feature could not have been anticipated by Nakamura.

In addition, in the invention of claim 1, the above-mentioned feature is included in order to extract a second image of the object corresponding to the first image from the seeking area for calculating the distance to the object using the parallax between the first and second images; however, in Nakamura, a process is carried out in which regions of high correlation value are determined in the extracted image in order to recognize the boundary of an object that is included in the extracted image with a high correlation value. Therefore, the purposes are different from each other, and thus constructions (or processes) are different from each other. In the invention of claim 1, it is not required to determine which regions have higher correlation value in the first image of the object. In Nakamura, it is not required to set areas outside the extracted image as seeking areas.

According to the invention of claim 1, by first performing a rough seeking process in the seeking area while moving the first image of the object stepwise at a moving increment, i.e., while using the extracted first image of the object like a template, a new seeking area, in which a second image of the object is likely exists, can be accurately extracted by a seeking process with a small amount of calculation. In contrast, in Nakamura, because a conventional correlation calculation is carried out in order to extract an image precisely corresponding to the integer

correspondence position, a considerable amount of calculation is required as prior art discussed in the specification.

Because Nakamura does not anticipate the claimed invention as discussed above, reconsideration and withdrawal of the rejection of claim 1 is respectfully requested.

In item 2 of the Office Action, the Examiner has rejected claim 2 under 35 USC 103(a) as being unpatentable over Nakamura. In the rejection, the Examiner states that Nakamura discloses all aspects of claim 2 except that he does not explicitly disclose that the moving increment is set to be equal to the width of the object frame, but Nakamura does disclose calculating the shift amount in Fig. 4. The Examiner takes official notice that it would be obvious at the time the invention was made to alter Nakamura's moving increment width to be the width of the object frame since Nakamura already discloses calculating the increment size and claim 2 merely suggests a specific size, which is an obvious variation to the disclosure of Nakamura.

Applicant's Response

The applicant respectfully disagrees with the rejection of claim 2 for the reasons stated above with respect to claim 1, from which it depends. In addition, the applicant submits that it would not be obvious to set the moving increment to be equal to the width of the object frame based on the actual disclosure of Nakamura since Nakamura does not disclose an object frame upon which such a distance could be set. Moreover, as regards to the calculating the shift amount as shown in Fig. 4, the value **d** shown in Fig. 4 corresponds to a decimal value at which the correlation value f(i) is minimum (col. 4, lines 1-3). Subsequently, Nakamura discloses shifting the images a uniform distance **d** (col. 4, lines 45-47). However, it appears that

Nakamura uses the reference d to represent two different quantities, since the shift distance d is used to shift the data rows prior to calculation of the decimal value d at which the correlation value f(i) is minimum.

Allowable Subject Matter

At item 3 of the Office Action, the Examiner has objected to claim 3 as being dependent upon a rejected base claim, but has indicated that claim 3 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The applicant has rewritten claim 3 herein to include the limitations of the base claim (claim 1) and the intervening claim (claim 2), whereby claim 3 is now in condition for allowance.

Other Matters

New claims 4-9 are added to the application which more clearly distinguish the applicant's invention from that of the prior art.

Claim 4 is an independent claim that is similar to original claim 1, but which clearly recites moving the first image of the object … stepwise <u>a distance equal to</u> the moving increment. By further defining the stepwise movement of the first image to differentiate from an overlapping movement, the applicant's invention, as claimed, is distinct from the prior art. This feature is supported in the specification at paragraphs 70-74.

Claims 5-7 depend from claim 4 and are directed to determination of the moving increment. These features are supported in the specification at paragraphs 70-72.

Claims 8 and 9 are based on original claim 1 and are directed to a method of analyzing an image, and are supported in Figs 3 and 5.

The applicant respectfully submits that no new matter is introduced into the application by the above amendments.

Conclusion

In conclusion, applicant has overcome the Examiner's rejection of the claims as presented in the Office Action; and moreover, applicant has considered all of the references of record, and it is respectfully submitted that the invention as defined by each of the present claims is clearly patentably distinct thereover.

The application is now believed to be in condition for allowance, and a notice to this effect is earnestly solicited.

If the Examiner is not fully convinced of all of the claims now in the application, applicant respectfully requests that the Examiner telephonically contact applicant's undersigned representative to expeditiously resolve prosecution of the application.

Favorable reconsideration is respectfully requested.

Respectfully submitted,

Joseph P. Carrier
Attorney for Applicant
Registration No. 31,748
(248) 344-4422

Customer No. 21828
Carrier, Blackman & Associates, P.C.
24101 Novi Road, Suite 100
Novi, Michigan 48375
November 9, 2006

CERTIFICATE OF ELECTRONIC TRANSMISSION

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office on November 9, 2006.

JPC/kmm